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MILITARY SPECIFICATION

CLOTH, GLASS, TAPE, TEXTILE GLASS; AND THREAD, GLASS AND WIRE-REINFORCED GLASS

This specification is approved for use by all Departments and Agencies of the Department of Defense

1 SCOPE

1.1 Scope. This specification covers fibrous glass cloth, tape, and sewing thread for use as thermal insulation components

1.2 Classification. Fibrous glass cloth, tape, and sewing thread shall be of the following types and classes, as specified (see 6.2.1).

Type I - Cloth

- Class 1 - Satin weave, light weight
- Class 2 - Satin weave, heavy weight, resin treated
- Class 3 - Plain weave, light weight
- Class 4 - Plain weave, light weight, pre-applied rewettable adhesive
- Class 5 - Modified plain weave, light weight.
- Class 6 - Modified plain weave, light weight, pre-applied rewettable adhesive.
- Class 7 - Modified plain weave, medium weight
- Class 8 - Modified plain weave, medium weight, pre-applied rewettable adhesive
- Class 9 - Plain weave, heavy weight
- Class 10 - Plain weave, heavy weight, aluminized

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter

AMSC N/A

FSC 8305

DISTRIBUTION STATEMENT A Approved for public release, distribution unlimited

Type II - Tape

- Class 1 - Plain weave, untreated
- Class 2 - Plain weave, resin treated
- Class 3 - Knitted, untreated
- Class 4 - Two-ply, untreated

Type III - Sewing thread

- Class 3 - Medium weight, polytetrafluoroethylene (PTFE) coated, sintered for machine hand sewing
- Class 4 - Heavy weight, PTFE coated, unsintered for hand sewing
- Class 5 - Medium weight, PTFE coated unsintered for machine sewing, wire-reinforced
- Class 6 - Heavy weight, PTFE coated, unsintered for hand and machine sewing, wire-reinforced.

2 APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-B-636 - Boxes, Shipping, Fiberboard.

MILITARY

MIL-A-3316 - Adhesives, Fire-Resistant, Thermal Insulation

STANDARDS

FEDERAL

FED-STD-191 - Textile Test Methods
FED-STD-595 - Colors

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection
by Attributes
MIL-STD-129 - Marking for Shipment and Storage

2.1.2 Other Government documents The following other Government documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

U S COAST GUARD (USCG)

Specification 164 009 - Test for Incombustibility.
Specification 164 012 - Interior Finishes for Merchant Vessels

(Application for copies should be addressed to the Commandant, US Coast Guard (G-E), 2100 Second Street, SW, Washington, DC 20593-0001)

(Copies of specifications, standards, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications The following documents form a part of this specification to the extent specified herein Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 478 - Standard Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Weaving Wire
- A 751 - Standard Methods, Practices, and Definitions for Chemical Analysis of Steel Products.
- D 204 - Standard Methods of Testing Sewing Threads
- D 578 - Standard Specification for Glass Fiber Yarns.
- D 579 - Standard Specification for Greige Woven Glass Fabric (DoD adopted)
- D 1448 - Standard Test Method for Micronaire Reading of Cotton Fibers
- D 3774 - Standard Test Methods for Width of Woven Fabric
- E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials (DoD adopted)
- F 205 - Standard Method for Measuring Diameter of Fine Wire by Weighing

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103)

UNIFORM CLASSIFICATION COMMITTEE AGENT

Uniform Freight Classification Ratings, Rules and Regulations

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents These documents also may be available in or through libraries or other informational services)

2.3 Order of precedence In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained

3 REQUIREMENTS

3 1 First article When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4 3 and 6 3).

3 2 Material Fibrous glass cloth, tape, and sewing thread shall be fabricated from fibrous glass yarn. Unless otherwise specified (see 6 2 1), type I, class 2 cloth and type II, class 2 tape shall be treated with a resin. Type II tapes, classes 1 and 2 shall contain one end or wale of organic yarn.

3 2 1 Yarn The yarn shall be made from continuous filament glass fiber. Yarns used to weave type I, classes 1 and 2, and type II, classes 1, 2, and 3 shall be made from low twist continuous filament glass. Yarns used to weave type I, classes 3 through 10, and type II, class 4 shall be from low twist continuous filament fibers that have been texturized to provide soft, high bulk characteristics.

3 2 2 Fiber diameter The average diameter of the glass fibers used for the yarns shall not exceed the following values except for type I, class 2, which shall have a tolerance of plus or minus 10 percent (see 4.6.1)

<u>Fiber</u>	<u>Maximum average</u>
Type I	
Class 1	0.00021
Class 2	.00036
Classes 3-9	.00025
Type II	
Classes 1-3	.00036
Class 4	.00025

3 3 Type I, cloth

3 3 1 Class 1, light weight, untreated. Class 1, light weight cloth shall be woven with an eight-harness satin weave.

3 3 2 Class 2, heavy weight, resin treated Class 2, heavy weight cloth shall be woven with a four-harness (crowfoot) satin weave.

3 3 3 Classes 3, 4, 9, and 10 Classes 3, 4, 9, and 10 shall be plain weave fabrics.

3 3 4 Classes 5, 6, 7, and 8 Classes 5, 6, 7, and 8 shall be modified two end plain weave fabrics.

3 3 5 Classes 3, 5, 7, and 9 Classes 3, 5, 7, and 9 shall be cleaned. No treatment shall be applied.

3 3 6 Classes 4, 6, and 8 Classes 4, 6, and 8 shall be adhesive treated (see 3 3 9 3).

3.3.7 Mechanical requirements Cloth shall conform to the requirements specified in tables I and II. A tolerance of plus or minus 10 percent shall be permitted in the specified weight of all classes, except for class 2 which shall be plus or minus 15 percent

3.3.8 Width The nominal width of the cloth shall be as specified (see 6.2.1), with the following tolerances (see 4.6.10)

Up to and including 40 inches	- plus or minus 1/2 inch
Over 40 inches, but not including 60 inches	- plus or minus 3/4 inch
60 inches and over	- plus or minus 1 inch.

3.3.9 Treatments

3.3.9.1 Basic cleaning Type I fabrics, except classes 1, 2, 4, 6, and 8 shall be heat treated or chemically cleaned to remove weaving starches and lubricants before being used as cloth laggings or insulation pad fabrics.

3.3.9.2 Resin treated Type I, class 2 shall be treated with a resin which has been shown to perform satisfactorily for the purposes intended (see 6.5)

3.3.9.3 Rewettable adhesives. Type I, classes 4, 6, and 8 shall be coated with a minimum deposit of 70 percent of adhesive. The treated fabric shall conform to the requirements of MIL-A-3316, class 1 for toxicity and irritancy, adhesive strength, flexibility, paintability, and fire resistance

3.3.9.4 Aluminum laminate (type I, class 10 only). An aluminum foil septum, minimum of 0.001 inch thickness, shall be laminated with a flame retardant adhesive to type I, class 9 cloth. This material shall meet the requirements of table II (see 4.6.9).

3.3.9.5 Coloring When specified (see 6.2.1), type I, classes 3, 5, 7, and 9 shall be identified with red coloring which conforms to red numbers 31158-31136 or 31302 of FED-STD-595 to identify non-asbestos material (see 6.1.1). The red material shall be flame-resistant, nontoxic, and mechanically equivalent to noncolored material of the same class, as determined previously during separate comparative testing (see 4.6.8.1 and 4.6.11.1). Fabric shall retain its color at 200 degrees Fahrenheit (°F) (see 4.6.12), and red coloring shall retain its permanence during normal installation and use (see 4.6.13)

3.3.10 Fire resistance Type I, classes 1, 3, 5, 7, and 9 shall meet the requirement for incombustibility (see 4.6.8.1). Class 2 shall have a flame spread classification of 20 maximum and a smoke density classification of 10 maximum (see 4.6.8.2). Classes 4, 6, 8, and 10 shall have an after flame and an afterglow of 0 seconds maximum, a char length of 0 inches maximum, and a flame travel of 1-1/2 inches maximum (see table II and 4.6.8.3).

3.3.11 Put up. Unless otherwise specified (see 6.2.1), the cloth shall be furnished in 50 ± 5-yard rolls. The minimum length in a spliced roll shall be 4 yards, and a spliced roll shall contain no more than three pieces for each 50-yard length

TABLE I. Requirements for cloth (type I).

Class	Description	Average weight ounces per square yard ¹			Yarns ² per inch		Breaking strength minimum, pounds per inch of width ³			
		Untreated	Basic cleaning	Treated ⁴	Warp ends	Filling picks	As received		After heating to 900°F for two hours	
							Warp	Filling	Warp	Filling
1	Satin weave light weight	8.65	---	---	56 ± 2	53 ± 2	200	180	60	60
2	Satin weave heavy weight	12.7	---	13.5	48 ± 2	32 ± 2	300	255	70	60
3	Plain weave light weight	---	8.5	---	18 ± 2	14 ± 2	100	45	35	15
4	Class 3 with rewettable adhesive	8.5	---	14.5	18 ± 2	14 ± 2	100	45	35	15
5	Modified plain weave light weight	---	8.5	---	18 ± 2	1 ± 2	100	40	35	15
6	Class 5 with rewettable adhesive	8.5	---	14.5	18 ± 2	14 ± 2	100	40	35	15
7	Modified plain weave medium weight	---	12.8	---	20 ± 2	16 ± 2	100	60	---	---
8	Class 7 with rewettable adhesive	12.8	---	22	21 ± 2	16 ± 2	125	80	---	---
9	Plain weave heavy weight	---	17.7	---	20 ± 2	14 ± 2	200	100	60	30
10	Class 9 with aluminum foil ⁵	---	17.7	20.5	20 ± 2	14 ± 2	200	100	---	---

See footnotes at top of next page.

¹ See 4 6 2² See 4 6 3³ See 4.6 4⁴ See 3 3 9 Increase in weight shall result from the respective treatments resin, adhesive or aluminized as applicable⁵ Type I, class 10 (laminated with aluminum foil) shall meet the requirements of table II

TABLE II Additional requirements of type I, class 10 aluminized cloth

Test	Specification	Method	Requirements	Tolerance
Thickness ¹	FED-STD-191	5030	0.032 inch	plus or minus 10 percent
Mullen burst ²	FED-STD-191	5122	500 pounds per square inch (lb/in ²)	minimum
Ignition loss ³	ASTM D 579		3 1 percent	maximum
Flame resistance ⁴	FED-STD-191	5903.2	⁵	maximum
Delamination ⁵	---	---	No delamination	---

¹ See 4 6 5² See 4.6 6³ See 4 6 7⁴ See 4 6 8⁵ See 4 6 9

⁶ After flame, 0 second
 Char length, 0 inches
 Afterglow, 0 second
 Flame travel, 1.5 inches

3 4 Type II, tape.

3 4 1 Class 1, woven, untreated, class 2, woven, treated, class 4, two-ply, untreated Class 1, untreated tape and class 2, resin treated tape shall be a plain weave Class 4, untreated tape shall be a two-ply weave For each class, the ends shall be properly interlocked with the picks to insure that there shall be no raveling of the tape edges

3 4 1 1 Basic cleaning Type II, class 4 material may be heat or chemically cleaned to remove weaving starches and lubricants

3 4.2 Class 3, knitted untreated. Class 3 tape shall be knitted The wales shall be properly interlocked with the courses to ensure that there shall be no raveling of the tape edges

3 4.3 Mechanical requirements. Tape shall conform to the requirements specified in table III A tolerance of plus or minus 10 percent will be permitted in the specified weight of the tape

TABLE III. Requirements for tape (type II).

Class	Average weight per square yard, ounces ¹		Tape ²	Yarns per inch ³		Breaking strength, minimum pounds per inch of width ⁴				Abrasion resistance minimum cycles to failure		
	Untreated	Treated		Thickness inch	Warp ends or wales per inch	Filling picks or courses per inch	As received		After heating to 900°F for 2 hours		As received	After heating to 900°F for 2 hours
							Warp	Filling	Warp	Filling		
1	5.80	---	0.007 ± 0.001	42 ± 2	32 ± 2	150	---	40	---	---	---	
2	5.80	7.05	.007 ± .001	42 ± 2	32 ± 2	150	---	40	---	---	---	
3 ⁵	4.50	---	.007 ± .001	23 ± 2	16 ± 2	40	---	21	---	---	---	
3 ⁵	8.00	---	.015 ± .002	15 ± 2	13.5 ± 2	70	---	21	---	---	---	
3	11.25	---	---	10 ± 2	22 ± 2	15	---	9	---	---	---	
4	70 ± 10 percent	---	.125 ± 10 percent	42 ± 2	12 ± 1	300	---	100	---	X ⁶	0.75 X ⁶	

¹ See 4.6.2.² See 4.6.5.³ See 4.6.3.⁴ See 4.6.4.⁵ See 6.2.1⁶ Number of cycles to failure after heating shall be 75 percent of average value obtained for same tape when tested as received (see 4.6.11.2). "X" = Original (as received) cycles to failure (minimum).

3.4.4 Tape distortion. There shall be no distortion of the tape (see 4.6.14).

3.4.5 Width. The nominal width of the tape shall be as specified (see 6.2.1). A tolerance of plus or minus 1/8 inch shall be permitted in the specific width of the tape. For class 4, tape over 3 inches in width shall have a tolerance of plus or minus 3/16 inch (see 4.6.10).

3.4.6 Fire resistance. Type II, classes 1, 3, and 4 shall meet the requirement for incombustibility (see 4.6.8.4). Class 2 shall have a flame spread classification of 20 maximum and a smoke density classification of 10 maximum (see 4.6.8.5).

3.4.7 Put up. Unless otherwise specified (see 6.2.1), the tape shall be furnished in 50-yard rolls. For class 4, tape shall be furnished in 100-foot rolls. The minimum length of each piece in a spliced roll shall be 4 yards, and no spliced roll shall contain more than three pieces.

3.5 Type III, sewing thread. Classes 3 through 6 shall be PTFE coated and shall have the properties specified in table IV. Class 5 and class 6 wire-reinforced glass thread shall be reinforced with type 304 corrosion resistant steel (CRES) or type 302 CRES wire (see 4.7.5). A tolerance of plus or minus 10 percent shall be permitted in the yards per pound and plus or minus 0.005 inch in the thread diameter specified in table IV. When tested, the total cross section of the wires shall be not less than 0.0050 ± 0.001 inch in diameter.

TABLE IV Requirements for type III, classes 3 through 6 thread

Class	Yards per pound plus or minus 10 percent		Coating minimum percent	Tensile minimum	Type finish	Type thread	Thread diameter (inch)	Diameter of wire (inch)	Type sewing
	Before treat- ment	After treat- ment							
3	1700	1500	12	20 pounds	Fully sintered	2 twist	0.021	N/A	Machine and hand
4	1330	1150	12	35 pounds	Unsintered	Braided	0.027	N/A	Hand
5	N/A	370	12	85 pounds	Unsintered	Braided	0.050	0.0050	Machine
6	N/A	340	12	85 pounds	Unsintered	Braided	0.050	0.0050	Hand and machine

3.5.1 Put up Unless otherwise specified (see 6.2.1), class 3 thread shall be furnished 2 pounds to a package plus or minus 10 percent on appropriate machine head sewing spool, minimum two splices per spool. Class 4 thread shall be furnished in 1/2 pound to a pack plus or minus 10 percent on paper tubes for ease in hand sewing, with no splices.

3.6 Identification of item. As applicable, a roll or spool shall have a label attached in such a manner as to remain in place and be clearly legible until all material has been removed. The label shall be legibly stamped or typed with water insoluble ink and shall contain the following information.

- (a) Stock number
- (b) Nomenclature (type and class)
- (c) Specification number
- (d) Yardage or footage (as applicable).
- (e) Contract number and date
- (f) Contractor's name
- (g) Name of contracting activity

3.7 Workmanship The finished cloth, tape, and thread shall conform to the quality and grade of product established by this specification. The occurrence of defects shall not exceed the applicable acceptable quality levels (AQL) specified herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (see 4.3)
- (b) Quality conformance inspection (see 4.4)

4.2.1 Lot. A lot shall consist of all finished materials of the same type, class, and dimensions produced at the same time under the same conditions and offered for delivery at one time. Unless otherwise specified, the lot size for cloth and tape shall be expressed in units of 1-linear yard, and lot size for thread shall be expressed in units of one spool

4.3 First article inspection. First article inspection shall consist of the examinations of 4.4.1 and the tests specified in 4.6 and 4.7 (see table V). The first article shall consist of one roll each of cloth or tape, or one spool of thread, as applicable (see 6.3).

4.4 Quality conformance inspection. Inspection for cloth and tape shall be in accordance with 4.4.1, 4.5.1, and table V. Inspection for thread shall be in accordance with 4.4.2, 4.5.2, and table V. When specified in the contract or order a certificate of compliance shall be prepared (see 6.2.2)

TABLE V. First article and quality conformance inspection.

Characteristic	Requirement	Test	First article	Quality conformance
Fiber diameter	3.2.2	4.6.1	X	X
Cloth construction				
Weight	table I	4.6.2	X	X
Yarn count	table I	4.6.3	X	X
Breaking strength	table I	4.6.4	X	X
Thickness	table II	4.6.5	X	X
Mullen burst	table II	4.6.6	X	X
Ignition loss	table II	4.6.7	X	X
Flame resistance	table II and 3.3.10	4.6.8.1, 4.6.8.2 and 4.6.8.3	X	Certificate of compliance
Delamination	table II	4.6.9	X	X
Width	3.3.8	4.6.10	X	X
Coloring	3.3.9.5	4.4.1.3	X	X
Abrasion resistance	3.3.9.5	4.6.11.1	X	X
Heat exposure	3.3.9.5	4.6.12	X	X
Moisture exposure	3.3.9.5	4.6.13	X	X
Tape construction				
Weight	table III	4.6.2		
Thickness	table III	4.6.5	X	X
Yarn count	table III	4.6.3	X	X
Breaking strength	table III	4.6.4	X	X
Abrasion resistance	table III	4.6.11.2	X	X
Distortion	3.4.4	4.6.14	X	X
Width	3.4.5	4.6.10	X	X
Fire resistance	3.4.6	4.6.8.4 and 4.6.8.5	X	Certificate of compliance

TABLE V. First article and quality conformance inspection. - Continued

Characteristic	Requirement	Test	First article	Quality conformance
Thread construction				
Weight	table IV	4.7.1	X	X
Breaking strength	table IV	4.7.2	X	X
Thread diameter	table IV	4.7.3	X	X
Wire diameter	table IV	4.7.4	X	X
Alloy of wire	3.5	4.7.5	X	X

4.4.1 Cloth and tape Cloth and tape shall be visually examined to determine conformance to the requirements of this specification. Defects for type I, all classes and type II, classes 1, 2, and 4 shall be determined in accordance with table VI. Defects for type II, class 3 shall be determined in accordance with table VII. The required yardage of each roll of cloth or tape shall be inspected on both sides (see 4.4.1.1), and the rolls shall be examined for gross length (see 4.4.1.2).

TABLE VI Classification of defects (woven cloth and tape).

Defects	Classification	
	Major	Minor
Bias or bowed filling, distorted from horizontal by more than 3 inches and clearly visible. ¹		X
Baggy, ridgy, or wavy, clearly visible. ¹	X	
Hole, cut, or tear	X	
Spots, streaks, stains		
Clearly visible, ¹ 2 inches or more in combined directions	X	
Clearly visible, ¹ less than 2 inches, but greater than 1/4 inch in combined directions		X
Smash - any	X	
Broken or missing ends or picks		
Three or more contiguous, regardless of length.	X	
Two contiguous, 2 inches or more in length	X	
Two contiguous, less than 2 inches in length		X
Single, complete pick or single end, 9 inches or over.		X
Floats and skips		
2 inches or more in combined warp and filling directions	X	
Less than 2 inches in combined warp and filling directions.		X
Thick area over 2 inches in length and 1/2 inch or more in width		X
Thin area over 2 inches in length and 1/2 inch or more in width	X	

See footnote at end of table

TABLE VI Classification of defects (woven cloth and tape). - Continued

Defects	Classification	
	Major	Minor
NOTES: (1) Thick warp and filling yarns caused by gluing broken yarns together shall be considered not a defect (2) Resin deposits caused by stoppage of finishing machine shall be considered not a defect, provided the cloth or tape is covered by resin.		
Selvage defects, curled or folded under.		X
Crease, hard embedded and folded over on self.	X	
Brittle or fused area, any.	X	
Delamination of aluminum coating over 1 inch square.	X	

¹ At normal inspection distance (approximately 3 feet)

TABLE VII. Classification of defects (knitted tape)

Defects	Classification	
	Major	Minor
Coarse yarn, clearly visible. ¹		X
Fine yarn clearly visible. ¹	X	
Run or dropped stitch - any.	X	
End out.	X	
Pulled stitch		X
Any thin places or unevenness of fabric resulting in a weak area.	X	
Unevenness of fabric, clearly visible ¹ but not resulting in a weak area.		X
Abrasion resulting in a weak area.	X	
Hole, cut or tear, any	X	
Weak place, clearly visible ¹	X	
Slub, slug, or gout more than three times the thickness of normal yarn.		X
Crease, hard embedded and folded over on self.		X
Edges cut, torn, folded, or rolled, any	X	
Edges scalloped or uneven.		X
Spots, stain, or streak, clearly visible and more than 1 inch or more combined directions.		X

¹ At normal inspection distance (approximately 3 feet).

4.4 1 1 Defects in rolls. For defects listed in tables VII and VIII, the unit of product shall be 1 linear yard. The inspection level for sampling in these tables shall be level II of MIL-STD-105. The sample size shall be taken proportionately from the number of rolls selected in accordance with inspection level S-2. The AQL shall be 2.5 major and 6.5 total defects (major

and minor combined) per 100 units (yards) for cloth less than 50 inches in width, 4.0 major and 10.0 total defects per 100 units for cloth 50 inches and more in width. The AQL for tape shall be 1.5 for major defects and 6.5 for total defects for 100 units (yards). When the total yardage in the roll does not exceed 50 yards, the entire roll shall be examined. When the total yardage in the roll exceeds 50 yards, only 50 yards shall be examined. Defects shall be counted regardless of their proximity to one another. Where two or more defects are in a single location, only the more serious defect shall be counted. A continuous defect shall be counted as one defect for each linear yard (or fraction of) in which it occurs. For defects listed below, the unit product shall be one roll. The AQL shall be 4.0 for all defects, and the number of rolls in the sample shall be selected in accordance with inspection level S-2 of MIL-STD-105. Defects shall be counted only once in each roll examined. The following shall be considered defects.

- (a) Uneven weaving or knitting throughout the roll.
- (b) Width beyond specified tolerances.
- (c) Selvage curled, folded, rolled, or slack continuously or intermittently throughout the roll.
- (d) Overall uncleanness.
- (e) Objectionable odor (odor of chemicals commonly used in finishing compounds shall be not regarded as objectionable)
- (f) Finish not uniform in color.

TABLE VIII. Classification of visual defects for thread

Defects	Classification	
	Major	Minor
Identification marking missing, incorrect, incomplete, illegible, or insecurely attached		X
Cleanliness		
Spot or stain, clearly visible ¹		X
Lumps or lint, clearly visible ¹		X
Package cut, torn, chafed, or otherwise defective or damaged package affecting strength of thread or interfering with free, unhampered, unwinding of thread.	X	
Winding improper or not firm would result in knots, kinks, entangling, or slippage during unwinding or otherwise affecting free, unhampered winding of thread.	X	

¹ At normal inspection distance (approximately 3 feet).

4.4.1.2 Length of rolls. The number of rolls in the sample shall be selected in accordance with inspection level S-2 of MIL-STD-105. The sample size shall be expressed in number of rolls, and the AQL shall be 4.0. Gross length found to be less than the specified minimum length or the gross length marked on the ticket shall be considered a defect. When stipulated, rolls containing pieces shorter than specified or more than the maximum number of pieces specified shall also be considered a defect. The lot shall be unacceptable if the total of the actual gross lengths in the sample is less than the total of the gross lengths marked on the tickets.

4.4.1.3 Color A random 1-yard sample of each lot shall be visually inspected for color. The lot shall be rejected if the color does not meet the requirements of 3 3 9 5.

4 4 2 Thread Thread shall be visually and dimensionally examined to determine conformance to the requirements of this specification. For examination of the item, defects shall be classified in accordance with 4 4 2.1, 4 4 2.2, or 4 4 2 3, as applicable.

4 4.2 1 Visual defects For the visual defects classified in table VIII, the unit of product shall be one spool, and the sample size shall be in accordance with inspection level I of MIL-STD-105. The AQL shall be 1 0 for major defects and 6 5 for total defects for 100 units (spools).

4.4.2.2 Length (for a holder). When thread is purchased by length (for a holder), the unit of product shall be one spool, and the sample size shall be in accordance with inspection level S-3 of MIL-STD-105. The AQL shall be 4.0 defects for 100 units (spools). For lots consisting of 500 or fewer units, the sample size shall be 10, and the acceptance number shall be 1. The length of the thread shall be determined by measuring the entire length of thread on the holder. Measurement shall be made over an accurate measuring clock under normal winding tensions. Length less than specified or less than indicated on the ticket shall constitute a defect.

4.4.2 3 Net weight (for a holder) When thread is purchased by weight, the unit of product shall be one spool, and the lot size shall be expressed in units of 1 linear yard. The number of spools in the sample shall be selected in accordance with inspection level S-2 of MIL-STD-105, and the AQL shall be 4 0. Net weight on a holder less than the minimum or more than the maximum specified shall constitute a defect.

4.5 Testing the end item Testing shall be in accordance with 4 6 and 4 7. The physical values specified in section 3 shall apply to the average of tests made on a unit of product.

4 5.1 Cloth and tape The unit of product for testing shall be 1 linear yard of cloth or 8 linear yards of tape. The unit of product for type I, class 10 aluminized cloth shall be 2 yards. The sample size for the tests listed in 4 6 (excluding mullen burst, ignition loss, and flame spread index) shall be in accordance with inspection level S-1 of MIL-STD-105. The lot size shall be expressed in units of 1 linear yard, and the sample size shall be expressed in number of rolls. For mullen burst, ignition loss, and flame spread, the sample size shall be in accordance with inspection level S-3 of MIL-STD-105. For these three tests, the lot size and sample size shall be expressed in number of rolls. The lot size shall be unacceptable if one or more units of product fail to meet any of these three test requirements.

4 5.2 Thread The unit of product for tests specified in 4.7 shall be one spool of thread. The sample size shall be in accordance with inspection level S-1 of MIL-STD-105, and the AQL shall be 6 5 test failures for 100 units.

4 6 Test procedures for cloth and tape.

4 6 1 Fiber diameter The diameter of the fiber shall be determined by one of the following methods (see 3 2 2)

- (a) Microscopic. Diameter of fibers shall be determined microscopically on the basis of measuring 50 random fibers. For purposes of determining conformance, the average diameter shall be the average of all measurements
- (b) Airflow The airflow method shall be measured by the micronaire instrument in accordance with ASTM D 1448, with the addition that the micronaire unit shall be calibrated for the purpose of testing fibrous glass
- (c) ASTM D 578, section 13 The determination of the diameter of textile glass fiber yarns shall be by the optical method

4 6.2 Weight of cloth and tape

4.6.2.1 Untreated cloth and tape The weight shall be in accordance with method 5040 or 5041 of FED-STD-191 (see table I or table III).

4 6 2 2 Treated cloth and tape The weight of the treated cloth and tape shall be in accordance with method 5040 or 5041 of FED-STD-191 to meet the requirements of tables I or III. The samples shall then be placed in an adequately vented oven to ensure complete circulation of the atmosphere of the entire oven chamber. A fan or other forced circulation method shall be preferable. The oven shall maintain a temperature of $800 \pm 10^{\circ}\text{F}$ until all the synthetic resin coating has been removed. The samples shall be removed and allowed to cool to room temperature. The weight of the samples without the resin shall be determined.

4 6 3 Construction of cloth and tape

4 6.3 1 Woven cloth and tape. The number of warp yarns and filling yarns for an inch shall be in accordance with method 5050 of FED-STD-191 (see table I or table II)

4 6 3 2 Knitted tape The number of wales and courses for an inch shall be in accordance with method 5070 of FED-STD-191

4 6 4 Breaking strength of cloth and tape

4.6 4 1 Method Unless otherwise specified, breaking strength shall be in accordance with method 5104 of FED-STD-191. Cloth specimens shall be cut in both warp and filling directions, for tape, only the warp yarns shall be tested. Five tests shall be made upon each sample, and the results averaged to give the breaking strength of the sample.

4 6 4 2 Set up In order to prevent the jaws of the testing machine from cutting the cloth, the ends of each specimen shall be coated with a polymer solution in accordance with ASTM D 579 or rubber or painted with thick shellac for a distance of 1-5/8 inches from each end and allowed to dry in the air before unravelled to the 1-inch width. Small pieces of manila paper or soft cotton twill fabric shall be inserted between the specimen and the face of each jaw.

4.6 4 3 Preparation. For determining the breaking strength after heating, a muffle furnace with accurate, automatic temperature control shall be used. For cloth, two specimens 6 inches long and 8 inches wide shall be cut, one with the 6-inch dimension parallel to the warp and the other with the dimension parallel to the filling. For tape, a suitable number of specimens 6 inches long and the full width of the tape shall be taken. The specimens shall be supported on a wire screen or perforated metal plate at least 1/2 inch above the floor of the furnace and not more than five specimens shall be superimposed upon one another. The furnace thermocouple shall be centrally located not more than 1/2 inch above the topmost specimen.

4.6 4 4 Heating. Specimens shall be placed inside the furnace with the temperature not over 200°F and with the furnace door partly open. The temperature shall gradually be raised to 500°F and maintained at this point, until all smoking ceases. The total time consumed in this operation shall be not less than 1 or more than 2 hours. Specimens shall be removed from the furnace and the temperature increased to 900°F. The specimens shall be replaced in the furnace and shall be maintained at 900°F for 2 hours. Then they shall be removed, allowed to cool to room temperature, and the required breaking strength strips cut and tested, as specified in 4.6 4.1

4 6 5 Thickness of type I, class 10 aluminized cloth and type II, classes 1, 2, and 3 tapes The thickness of the cloth and tape shall be in accordance with method 5030 of FED-STD-191 (see tables II and III).

4.6 6 Mullen burst strength of type I, class 10 aluminized cloth The mullen burst strength of the cloth shall be in accordance with method 5122 of FED-STD-191. The faces of both clamping jaws shall be covered with fabric reinforced, vulcanized rubber stock 1/4 to 3/8 inch thick that shall be bonded to the surfaces with a suitable metal or rubber cement. In addition, a D-1 type diaphragm shall be used.

4.6.7 Ignition loss of type I, class 10 aluminized cloth The ignition loss shall be in accordance with ASTM D 579.

4.6 8 Flame resistance.

4.6 8 1 Type I, classes 1, 3, 5, 7, and 9. Classes 1, 3, 5, 7, and 9 of type I shall be tested in accordance with USCG 164 009 (see 3.3 10 and 4.4).

4 6 8 2 Type I, class 2 Type I, class 2 shall be tested in accordance with either USCG 164.012 or ASTM E 84 (see 3 3.10 and 4 4)

4.6.8 3 Type I, classes 4, 6, 8, and 10 Classes 4, 6, 8, and 10 of type I shall be tested in accordance with method 5903.2 of FED-STD-191 (see 3.3 10 and 4 4).

4.6.8.4 Type II, classes 1, 3, and 4. Classes 1, 3, and 4 of type II shall be tested in accordance with USCG 164.009 (see 3.4.6 and 4.4).

4 6 8 5 Type II, class 2 Type II, class 2 shall be tested in accordance with either USCG 164 012 or ASTM E 84 (see 3 4 6 and 4 4)

4 6 9 Delamination test of type I, class 10 aluminized cloth There shall be no delamination after 1 hour exposure at 300°F. After this exposure, the aluminum foil shall not rip off by hand in pieces larger than 1-inch square.

4 6 10 Width of cloth and tape Width shall be determined in accordance with ASTM D 3774 (see 3 3 8 and 3 4 5).

4 6 11 Abrasion testing

4 6 11 1 Type I red lagging Testing shall be conducted using a Wyzenbeek testing machine with an abrasive grit size of 320 and applied load and tension both equal to 4 pounds (see 3.3 9 5).

4 6 11 2 Type II, class 4 tape. Testing shall consist of abrading the subject tape on a Wyzenbeek testing machine until the total thickness of the sample is penetrated. The standard sample size shall be 1/8-inch in thickness and 2 inches in width. The number of cycles to achieve penetration shall be recorded. For each subject tape, a total of four samples shall be tested for each condition as received and after being heated to 900°F for 2 hours. The test shall be performed using an abrasive grit size of either 100 or 320 with applied load and tension equal to 4 pounds. The set of results shall be averaged to give the abrasion resistance for the subject tape (see table III).

4 6 12 Heat exposure Samples of 2-inch sections shall be placed in an electric furnace equipped with calibrated thermocouples. The temperature shall be gradually raised approximately 25 to 30°F every 15 minutes until each of the samples is visually noted to have lost its red coloring (that is, turned white). The temperature at which this occurs shall be in accordance with 3 3 9.5.

4 6 13 Moisture exposure Sections from a sample shall be immersed in a beaker of distilled water for a 72-hour period. After removal of the cloths, a spectrometer shall be used to measure the extent of red color present in the resultant solutions. The test shall produce a virtually colorless solution (see 3 3 9 5).

4 6 14 Distortion of tape. A sample of the tape, 24 inches in length, shall be spread out across a flat, horizontal surface and observed for evidence of distortion, such as tendency to curl rather than lie flat.

4 7 Test procedures for thread.

4 7.1 Yards per pound for thread. Thirty yards of thread shall be reeled off on a standard wrap reel. The specimen shall be hung on a wire rod and placed in a furnace at least 1000°F until all the fiber coating is burned off. The thread shall not touch any part of the furnace and shall be removed before starting to fuse or melt. When cooled to ambient conditions, the specimen shall be weighed to the nearest 0.01 gram, and the yardage by the pound computed in accordance with method 4010 of FED-STD-191 (see table IV).

4 7 2 Breaking strength of thread

4 7 2.1 Procedure The testing machine shall be of the pendulum type. The grips shall consist of highly polished metal cylinders not less than 2 inches in diameter and 2 inches long having a metal rod or pin attached to them for the purpose of snubbing the specimen to be tested. The initial distance between centers of drums shall be 10 inches, and the drums shall separate at a uniform rate of $12 \pm 1/2$ inches per minute under no load. Several yards of thread shall be unwound from the spool and discarded. The test specimen shall be pulled from the side of the spool in order to not disturb the twist. The thread shall be passed three times around each drum so that a 1/16-inch space is left between wraps, and the ends shall be knotted or snubbed around the pins provided for this purpose. Five tests shall be made upon each sample, and the results averaged to give the breaking strength of the sample.

4 7.2 2 Specimen If a specimen slips in the jaws, breaks in the jaws, breaks at the edge of the jaws or if for any reason attributable to faulty operation, the result falls markedly below the average for the set, the results shall be disregarded. Another specimen shall then be taken, and the result of this break included in the average (see table IV).

4 7 3 Thread diameter Thread diameter shall be in accordance with ASTM D 204 (see table IV).

4 7 4 Diameter of wire The diameter of the wire shall be tested in accordance with ASTM F 205 to determine conformance to table IV.

4.7 5 Alloy of CRES wire The alloy of the steel wire type 304 CRES or type 302 CRES shall conform to ASTM A 478 and shall be in accordance with ASTM A 751 (see 3 5).

4 8 Packing inspection An inspection shall be made to determine that the packaging requirements of section 5 and documents referenced therein are complied with. Defects shall be scored in accordance with table IX. The sample unit shall be one shipping container fully prepared for delivery with the exception that it need not be sealed. Defects listed below shall be examined on shipping containers fully prepared for delivery with the exception that it need not be sealed. Defects listed below shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 of MIL-STD-105 and the AQL shall be 4 0 defects for 100 units.

TABLE IX Packaging inspection.

Examination	Defects
Markings (Exterior and interior)	Missing, incorrect, illegible, of improper size, location sequence, or method of application.
Materials	Any nonconforming component, component missing, damaged, or otherwise defective affecting serviceability.
Workmanship	Inadequate application of components such as incomplete closure of container flaps, waterproofing, reinforcing, bulging, or distortion of containers.
Weight exterior	Gross or net weight exceeds requirements.

5 PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition)

5 1 Preservation-packaging Preservation-packaging shall be level A or C as specified (see 6.2 1)

5 1.1 Level A

5 1 1 1 Unit pack Rolls of cloth and tape, and spools of thread shall be individually unit packaged by one of the following methods The selection of the method shall be the contractor's option

- (a) Wrapping in not less than 60-pound minimum basis weight kraft paper. Wrapping shall be secured with gummed or pressure sensitive tape
- (b) Shrink wrapping Shrink wrapping shall be either by skin or blister packaging

5 1 1.2 Intermediate pack Unit quantities in intermediate containers shall be as specified (see 6.2 1) Intermediate containers shall conform to PPP-B-636, class domestic. Boxes shall be closed in accordance with method I as specified in the appendix to the box specification The gross weight shall not exceed 20 pounds

5 1 2 Level C Cloth, tape, and thread shall be packaged to protect against deterioration and physical damage during shipment from supply source to the first receiving activity for immediate use The contractor's normal retail or wholesale preservation-packaging methods shall be used when such meet the requirements of this level

5 2 Packing Packing shall be level A, B, or C, as specified (see 6 2.1)

5.2.1 Level A Cloth and tape of one class and width, and thread of one class only, packaged as specified (see 5.1), shall be packed in containers conforming to class weather-resistant, as specified in PPP-B-636. Boxes shall be closed and waterproofed, method V, as specified in the appendix to the box specification. Reinforcing of boxes shall be accomplished by the use of non-metallic banding or pressure-sensitive tape at the contractor's option.

5.2.2 Level B Cloth and tape of one class and width, and thread of one class only, packaged as specified (see 5.1), shall be packed in containers conforming to class domestic or class weather-resistant, as specified in PPP-B-636. Box closures shall be as specified for method I in accordance with the appendix of the box specification.

5.2.3 Level C. Cloth, tape, and thread, packaged as specified (see 5.1), shall be packed in containers at the lowest rates which shall ensure acceptance by common carrier and shall protect against physical damage during direct shipment from the supply source to the first receiving activity for immediate use. In general, this level shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation.

5.3 Marking In addition to any special marking specified in the contract or order (see 3.6 and 6.2.1), each unit (kraft or shrink wrap) and intermediate package and shipping container shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The fibrous glass cloth, in type I, classes 1, 2, 3, 5, 7, and 9, tape in type II, classes 1, 2, and 3; and sewing thread in type III, classes 3 through 6 are intended for use in the fabrication of thermal insulation components, such as cloth lagging material or jacket over thermal insulation, a covering or outer layer on removable thermal insulation pads, or as a facing for hull insulation board. Type I, class 10 is used to fabricate safety spray shields, and type II, class 4 is intended for use in pipe hanger liner applications.

6.1.1 Red lagging (type I). Red lagging is intended to provide a system for color coding to identify asbestos-free thermal insulation systems.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification
- (b) Type and class required (see 1.2).
- (c) When first article is required (see 3.1).
- (d) When type I, class 2 and type II, class 2 shall not be treated with resin (see 3.2).
- (e) Width of cloth or tape required (see 3.3.8 and 3.4.5).
- (f) When red cloth is required (see 3.3.9.5).
- (g) Put up of cloth and tape, if other than specified (see 3.3.11 and 3.4.7).
- (h) Weight and class of tape required (see table III)

- (i) Class and number of spools of thread required (see 3 5 1 and table IV)
- (j) Put up of thread, if other than specified (see 3 5 1)
- (k) Levels of packing and packaging required (see 5 1 and 5 2)
- (l) Unit quantities to be packaged in intermediate container (see 5 1 1 2)
- (m) Special marking, if required (see 5 3)

6 2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DoD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraph

<u>Paragraph no</u>	<u>Data requirement title</u>	<u>Applicable DID no</u>	<u>Option</u>
4 4	Certificate of compliance	DI-E-2121	----

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5010 12-L, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6 2 2 1 The data requirements of 6 2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports)

6 3 First article When a first article inspection is required, the items should be a first article sample. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6 4 Care of fabric Fabrics treated with pre-applied rewettable adhesive are not washable nor is the adhesive permanently set until after the fabric has been painted with a waterproof mastic or paint and has thoroughly dried

6.5 Resins Resin treatments that have been found satisfactory are polyvinylacetate, modified nylon resins and acrylic resins

6.6 Type III, classes 5 and 6 Type III, classes 5 and 6 (wire reinforced sewing thread) are used for sewing the "HOT" side of removable pads

6.7 Subject term (key word) listing

Aluminum foil system
Aluminum laminate
Delamination
Fibrous glass yarn
Polytetrafluoroethylene

6.8 Supersession data This specification supersedes MIL-C-0020079G, dated 20 August 1982, MIL-C-0020079F, dated 3 June 1980, and MIL-C-20079E, dated 15 May 1975. A cross reference of type and class designations appears in table X

TABLE X. Supersession data

MIL-C-20079H	MIL-C-0020079G	MIL-C-0020079F	MIL-C-20079E
Type I-Cloth	Type I-Cloth	Type I-Cloth	Type I-Cloth
Class 1	Class 1	Class 1	Class 1
Class 2	Class 2	Class 2	Class 2
Class 3	Class 3	Class 3	Class 3
Class 4	Class 4	Class 4	Class 4
Class 5	Class 5	Class 5	Class 5
Class 6	Class 6	Class 6	Class 6
Class 7	Class 7	Class 7	Class 7
Class 8	Class 8	Class 8	Class 8
Class 9	Class 9	Class 9	Class 9
Class 10	Class 10	Class 10	Class 10
Type II-Tape	Type II-Tape	Type II-Tape	Type II-Tape
Class 1	Class 1	Class 1	Class 1
Class 2	Class 2	Class 2	Class 2
Class 3	Class 3	Class 3	Class 3
Class 4	Class 4	Class 4	Class 4
Type III-Sewing thread	Type III-Sewing thread	Type III-Sewing thread	Type III-Sewing thread
Class 3	Class 3	Class 3	Class 3
Class 4	Class 4	Class 4	Class 4
Class 5	-----	-----	-----
Class 6	-----	-----	-----

6 9 Changes from previous issue Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes

Custodians.

Army - ME

Navy - SH

Air Force - 99

Preparing activity.

Navy - SH

(Project 8305-0869)

Review activities

Army - AR, MI

Navy - NV, YD

User activities

Air Force - 45

Navy - AS

(See Instructions - Reverse Side)

DD FORM 1426
82 MAR

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INSTRUCTIONS. In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (**DO NOT STAPLE**), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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